REMARKS

Status Of Application

Claims 1-15 were pending in the application; the status of the claims is as follows:

Claims 1, 2, 5-7, 10-12, and 15 are rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,613,782 to Mori *et al* (hereinafter "Mori"); and

Claims 3, 4, 8, 9, 13, and 14 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Mori.

New claims 16-24 have been added by this Amendment.

Drawings

The indication, in the Office Action, that drawings filed on December 15, 2000, are accepted by the Examiner, is noted with appreciation.

Claim Amendments

Claims 1, 3, 4, 6, 8, 9, 11, 13, and 14 have been amended to more particularly point out and distinctly claim the invention. Claims 3 and 4 have been further amended to provide for consistency with claim 1 as a result of changes made herein to claim 1, claims 8 and 9 have been further amended to provide for consistency with claim 6 as a result of changes made herein to claim 6, and claims 13 and 14 have been further amended to provide for consistency with claim 11 as a result of changes made herein to claim 11.

Claim 7 has been amended to improve the form thereof. The change to claim 7 is unrelated to the patentability of the invention and is not necessitated by prior art. Claims 16-24 have been added to provide a more adequate basis for protection of the invention.

35 U.S.C. § 102(b) Rejection

The rejection of claims 1, 2, 5-7, 10-12, and 15 under 35 U.S.C. § 102(b), as being anticipated by Mori, is respectfully traversed based on the following.

Claims 1, 2, and 5

Claims 2 and 5 depend from claim 1. Accordingly, the following discussion regarding claim 1 applies equally to claims 2 and 5.

Claim 1, as amended, recites:

> An actuator comprising:
> a displacement element for generating a specific displacement;
> a displacement expander for transmitting the displacement of said displacement element and expanding the displacement;
> a transmitter for transmitting the displacement expanded by said displacement expander to a driven member;
> a presser for pressing said transmitter against the driven member; and
> **a driver** for driving the displacement element by **providing a drive signal that oscillates the displacement element at a first phase angle** and **oscillates the displacement expander at a second phase angle substantially supplementary to said first phase angle**, thereby causing oscillations of said displacement element to be restrained by oscillations of said displacement expander

(Emphasis added). Thus, claim 1, as amended, requires a driver that provides a drive signal that oscillates the displacement element and the displacement expander at substantially supplementary phase angles.

Mori discloses an actuator that includes a displacement element, piezo-electric device 2, connected in series with a displacement transmitter, resultant motion mechanism 18. The piezo-electric device 2 is driven with an AC voltage so that the piezo-electric device 2 generates a displacement 6. The displacement 6 is transmitted by the resultant motion mechanism 18 to a driving element 10 for contact-driving a driven element 11. However, Mori fails to teach anything related driving the piezo-electric device 2 using a drive signal that oscillates the resultant motion mechanism 18 and the piezo-electric device 2 out of phase with one another. Therefore, Mori certainly cannot teach the more specific approach of including a driver that provides a drive signal that

oscillates the displacement element and the displacement expander at substantially supplementary phase angles.

Therefore, since Mori fails to disclose or suggest all of the limitations of claim 1, Mori cannot anticipate or render obvious claim 1. Since claims 2 and 5 depend from claim 1, Mori cannot anticipate or render obvious claims 2 and 5 for at least the same reasons discussed above with regard to claim 1.

Claims 6, 7 and 10

Claims 7 and 10 depend from claim 6. Accordingly, the following discussion regarding claim 6 applies equally to claims 7 and 10.

Claim 6, as amended, recites in part:

> **a driver** for driving each of said first and second displacement elements by providing a **first drive signal that oscillates the first displacement element at a first phase angle and oscillates the first displacement expander at a second phase angle substantially supplementary to said first phase angle**, and by providing **a second drive signal that oscillates the second displacement element at a third phase angle and oscillates the second displacement expander at a fourth phase angle substantially supplementary to said third phase angle,** thereby causing oscillations of said first and second displacement elements to be restrained by oscillations of said first and second displacement expanders

(Emphasis added). Thus, claim 6, as amended, requires a driver that provides a drive signal that oscillates a respective displacement element and a respective displacement expander at substantially supplementary phase angles.

As discussed with regard to claim 1, Mori fails to teach a driver that provides a drive signal that oscillates the displacement element and the displacement expander at substantially supplementary phase angles. Therefore, Mori fails to disclose or suggest all of the limitations of claim 6, and, accordingly, Mori cannot anticipate or render obvious claim 6.

Since claims 7 and 10 depend from claim 6, Mori cannot anticipate or render obvious claims 7 and 10 for at least the same reasons discussed above with regard to claim 6.

Claims 11, 12, and 15

Claims 12 and 15 depend from claim 11. Accordingly, the following discussion regarding claim 11 applies equally to claims 12 and 15.

Claim 11, as amended, recites in part:

> a driver for driving said displacement element,
> wherein the driver includes **an oscillator** for providing a drive signal that **oscillates the displacement element at a first phase angle** and **oscillates the displacement expander at a second phase angle substantially supplementary to said first phase angle**, thereby causing said specific displacement of said displacement element to be restrained by contractions or expansions of said displacement expander

(Emphasis added). Thus, claim 11, as amended, requires a driver that include an oscillator, wherein the oscillator provides a drive signal that oscillates the displacement element and the displacement expander at substantially supplementary phase angles.

As discussed with regard to claim 1, Mori fails to teach a driver that provides a drive signal that oscillates the displacement element and the displacement expander at substantially supplementary phase angles. Thus, it follows that Mori fails to teach a driver that includes an oscillator, wherein the oscillator provides a drive signal that oscillates the displacement element and the displacement expander at substantially supplementary phase angles. Therefore, Mori fails to disclose or suggest all of the limitations of claim 11, and, accordingly, Mori cannot anticipate or render obvious claim 11.

Since claims 12 and 15 depend from claim 11, Mori cannot anticipate or render obvious claims 12 and 15 for at least the same reasons discussed above with regard to claim 11.

Accordingly, it is respectfully requested that the rejection of claims 1, 2, 5-7, 10-12, and 15 under 35 U.S.C. § 102(b) be reconsidered and withdrawn.

35 U.S.C. § 103(a) Rejection

The rejection of claims 3, 4, 8, 9, 13, and 14 under 35 U.S.C. § 103(a), as being unpatentable over Mori, is respectfully traversed based on the following.

Claims 3 and 4

Claims 3 and 4 depend, directly or indirectly, from claim 1. As pointed out above regarding claim 1, Mori fails to teach a driver that provides a drive signal that oscillates the displacement element and the displacement expander at substantially supplementary phase angles and, therefore, Mori cannot render claim 1 obvious. Since claims 3 and 4 depend, directly or indirectly, from claim 1, Mori cannot render claims 3 and 4 obvious for at least the same reasons discussed with regard to claim 1.

In addition, claims 3 and 4 each, as amended, recite in part:

> said **displacement element is driven by the drive signal,** wherein the **drive signal has a frequency near the simple natural frequency of said displacement expander**, and wherein said simple natural frequency of the displacement expander is different than the simple natural frequency of the displacement element

(Emphasis added). Thus, as amended, each of claims 3 and 4 require driving the displacement element with a drive signal that has a frequency near the simple natural frequency of the displacement expander, the simple natural frequency of the displacement element being different than the simple natural frequency of the displacement expander.

In the present Office Action, it is noted that Mori does not disclose a frequency for driving the displacement element. Instead, the present rejection relies on an Official Notice taken in the present Office Action to teach the frequency for driving the displacement element:

> it was [a] well known scientific principle that **objects** are driven most efficiently at **their resonant frequency**. It would have been obvious...to drive [the] **displacement element** near the **resonant frequency of the displacement expander**

(Emphasis added).[1] However, applicants respectfully point out that driving an object at the object's resonant frequency is not the same as driving an object (i.e., displacement element) at some other object's (i.e., displacement expander's) resonant frequency. Thus, the rationale that "it was well known ...that objects are driven most efficiently at their resonant frequency" does not apply to the claims in question, and, thus, fails to support the allegation that it would have been obvious to drive an object (i.e., displacement element) near the resonant frequency of another object (i.e., displacement expander).

Further, the AC voltage in the Mori actuator is generated by a signal generator 12, and a controller 16 controls the frequency of the signal generator 12. However, the only disclosure found in Mori related to controlling or selecting a frequency simply states "the driving frequency of the piezo-electric devices can be enlarged to some dozens of KHz, and the driving speed can be relatively increased."[2] Thus, Mori is silent with regard to providing a driving signal for driving the piezo-electric device 2, wherein the driving signal has a frequency near the simple natural frequency of the resultant motion mechanism 18.

Still further, even if Mori is considered in combination with the concept that objects are driven most efficiently at their resonant frequency, as asserted as prior art in the official notice, there is still no suggestion of driving the piezo-electric device 2 at a frequency near the simple natural frequency of the resultant motion mechanism 18. Instead, the combination only provides teaching related to either enlarging the frequency to increase speed or driving the piezo-electric device 2 at the natural frequency of the piezo-electric device 2. Therefore, Mori, both alone and in combination with the asserted prior art in the official notice, fails to disclose or suggest all of the limitations of claims 3 and 4, and, accordingly, cannot render obvious claim 3 and 4, respectively.

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[1] Office Action, page 3, lines 14-17 (May 8, 2002).
[2] Mori, col. 8, lines 54-56.

Claims 8 and 9

Claims 8 and 9 depend, directly or indirectly, from claim 6. As pointed out above regarding claim 6, Mori fails to teach a driver that provides a drive signal that oscillates the displacement element and the displacement expander at substantially supplementary phase angles and, therefore, Mori cannot render claim 6 obvious. Since claims 8 and 9 depend, directly or indirectly, from claim 6, Mori cannot render claims 8 and 9 obvious for at least the same reasons discussed with regard to claim 6.

In addition, claims 8 and 9 each, as amended, recite in part:

> said **first and second displacement elements are respectively driven by said first and second drive signals**, wherein each of said **first and second drive signals has a frequency near the simple natural frequency of said first and second displacement expanders, respectively**, and wherein the simple natural frequency of the first displacement expander is different than the simple natural frequency of the first displacement element and the simple natural frequency of the second displacement expander is different than the simple natural frequency of the second displacement element.

(Emphasis added). Thus, as amended, each of claims 8 and 9 require driving a displacement element with a respective drive signal that has a frequency near the simple natural frequency of a respective displacement expander, the simple natural frequency of the displacement element being different than the simple natural frequency of the respective displacement expander.

As pointed out above regarding claims 3 and 4, Mori is silent with regard to providing a driving signal for driving the piezo-electric device 2, wherein the driving signal has a frequency near the simple natural frequency of the resultant motion mechanism 18. As also pointed out above, even if Mori is considered in combination with the concept that objects are driven most efficiently at their resonant frequency, as asserted as prior art in the official notice, there is still no suggestion of driving the piezo-electric device 2 at a frequency near the simple natural frequency of the resultant motion mechanism 18. Therefore, Mori, both alone and in combination with the asserted prior art

in the official notice, fails to disclose or suggest all of the limitations of claims 8 and 9, and, accordingly, cannot render obvious claim 8 and 9, respectively.

Claims 13 and 14

Claims 13 and 14 depend, directly or indirectly, from claim 11. As pointed out above regarding claim 11, Mori fails to teach a driver that includes an oscillator, wherein the oscillator provides a drive signal that oscillates the displacement element and the displacement expander at substantially supplementary phase angles and, therefore, Mori cannot render claim 11 obvious. Since claims 13 and 14 depend, directly or indirectly, from claim 11, Mori cannot render claims 13 and 14 obvious for at least the same reasons discussed with regard to claim 11.

In addition, claims 13 and 14 each, as amended, recite in part:

> said **displacement element is driven by the drive signal**, wherein the **drive signal has a frequency near the simple natural frequency of said displacement expander**, and wherein said simple natural frequency of the displacement expander is different than the simple natural frequency of the displacement element

(Emphasis added). Thus, as amended, each of claims 13 and 14 require driving the displacement element with a drive signal that has a frequency near the simple natural frequency of the displacement expander, the simple natural frequency of the displacement element being different than the simple natural frequency of the displacement expander.

As pointed out above regarding claims 3 and 4, Mori is silent with regard to providing a driving signal for driving the piezo-electric device 2, wherein the driving signal has a frequency near the simple natural frequency of the resultant motion mechanism 18. As also pointed out above, even if Mori is considered in combination with the concept that objects are driven most efficiently at their resonant frequency, as asserted as prior art in the official notice, there is still no suggestion of driving the piezo-electric device 2 at a frequency near the simple natural frequency of the resultant motion mechanism 18. Therefore, Mori, both alone and in combination with the asserted prior art

in the official notice, fails to disclose or suggest all of the limitations of claims 13 and 14, and, accordingly, cannot render obvious claim 13 and 14, respectively.

Accordingly, it is respectfully requested that the rejection of claims 3, 4, 8, 9, 13, and 14 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

New Claims

New claims 16-24 have been added to provide a more adequate basis for protection of the invention. No new matter has been added.

New claims 16-18 depend, directly or indirectly, from claim 1. Therefore, claims 16-18 are considered to be in condition for allowance for at least the reasons discussed above regarding claim 1.

New claims 19-21 depend, directly or indirectly, from claim 6. Therefore, claims 19-21 are considered to be in condition for allowance for at least the reasons discussed above regarding claim 6.

New claims 22-24 depend, directly or indirectly, from claim 11. Therefore, claims 16-18 are considered to be in condition for allowance for at least the reasons discussed above regarding claim 11.

CONCLUSION

Wherefore, in view of the foregoing amendments and remarks, this application is considered to be in condition for allowance, and an early reconsideration and a Notice of Allowance are earnestly solicited.

This Amendment increases the total number of claims by nine (9) to twenty-four (24) from fifteen (15), but does not increase the number of independent claims, and does not present any multiple dependency claims. Accordingly, a Response Transmittal and Fee Authorization form authorizing the amount of $72.00 to be charged to Sidley Austin

Brown & Wood LLP's Deposit Account No. 18-1260 is enclosed herewith in duplicate. However, if the Response Transmittal and Fee Authorization form is missing, insufficient, or otherwise inadequate, or if a fee, other than the issue fee, is required during the pendency of this application, please charge such fee to Sidley Austin Brown & Wood LLP's Deposit Account No. 18-1260.

Any fee required by this document other than the issue fee, and not submitted herewith should be charged to Sidley Austin Brown & Wood LLP's Deposit Account No. 18-1260. Any refund should be credited to the same account.

If an extension of time is required to enable this document to be timely filed and there is no separate Petition for Extension of Time filed herewith, this document is to be construed as also constituting a Petition for Extension of Time Under 37 C.F.R. § 1.136(a) for a period of time sufficient to enable this document to be timely filed.

Any other fee required for such Petition for Extension of Time and any other fee required by this document pursuant to 37 C.F.R. §§ 1.16 and 1.17, other than the issue fee,

and not submitted herewith should be charged to Sidley Austin Brown & Wood LLP's Deposit Account No. 18-1260. Any refund should be credited to the same account.

Respectfully submitted,

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September 6, 2002

APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

The following is a marked-up version of the changes to the claims which are being made in the attached response to the Office Action dated May 8, 2002.

IN THE CLAIMS:

1. (Twice Amended) An actuator comprising:

a displacement element for generating a specific displacement;

a displacement expander for transmitting the displacement of said displacement element and expanding the displacement;

a transmitter for transmitting the displacement expanded by said displacement expander to a driven member;

a presser for pressing said transmitter against the driven member; and

a driver for driving the displacement element by providing a drive signal that oscillates the displacement element at a first phase angle and oscillates the displacement expander at a second phase angle substantially supplementary to said first phase angle, thereby causing ~~such that~~ oscillations of said displacement element to be ~~are~~ restrained by oscillations of said displacement expander.

3. (Once Amended) An actuator as claimed in claim 2, wherein said displacement element is driven by ~~a~~ the drive signal, wherein the drive signal has ~~signal of~~ a frequency near the simple natural frequency of said displacement expander, and wherein said simple natural frequency of the displacement expander is different than the simple natural frequency of the displacement element. ~~expander.~~

4. (Once Amended) An actuator as claimed in claim 1, wherein said displacement element is driven by ~~a~~ the drive signal, wherein the drive signal has ~~signal of~~ a frequency near the simple natural frequency of said displacement expander, and wherein

said simple natural frequency of the displacement expander is different than the simple natural frequency of the displacement element. ~~expander.~~

6. (Twice Amended) An actuator comprising:

a first displacement element for generating a specific displacement;

a second displacement element for generating a specific displacement of which a direction is cross to a direction of the specific displacement of said first displacement element;

a first displacement expander, which is connected in series to said first displacement element, for transmitting the displacement of said first displacement element and expanding the displacement;

a second displacement expander, which is connected in series to said second displacement element, for transmitting the displacement of said second displacement element and expanding the displacement;

a tip member, which is arranged at an intersection end of said first and second displacement elements, for transmitting the displacement expanded by said first and second displacement expanders to a driven member;

a presser for pressing said tip against the driven member; and

a driver for driving each of said first and second displacement elements by providing a first drive signal that oscillates the first displacement element at a first phase angle and oscillates the first displacement expander at a second phase angle substantially supplementary to said first phase angle, and by providing a second drive signal that oscillates the second displacement element at a third phase angle and oscillates the second displacement expander at a fourth phase angle substantially supplementary to said third phase angle, thereby causing ~~such that~~ oscillations of said first and second displacement elements to be ~~are~~ restrained by oscillations of said first and second displacement expanders.

7. (Twice Amended) An actuator as claimed in claim 6, wherein the spring constants of said first and second displacement expanders are respectively less than the spring constants of said first and second displacement elements.

8. (Once Amended) An actuator as claimed in claim 7, wherein said first and second displacement elements are respectively driven by said first and second drive signals, wherein each of said first and second drive signals has ~~signals of~~ a frequency near the simple natural frequency of said first and second displacement expanders, respectively, and wherein the simple natural frequency of the first displacement expander is different than the simple natural frequency of the first displacement element and the simple natural frequency of the second displacement expander is different than the simple natural frequency of the second displacement element. ~~expanders.~~

9. (Once Amended) An actuator as claimed in claim 6, wherein said first and second displacement elements are respectively driven by said first and second drive signals, wherein each of said first and second drive signals has ~~signals of~~ a frequency near the simple natural frequency of said first and second displacement expanders, respectively, and wherein the simple natural frequency of the first displacement expander is different than the simple natural frequency of the first displacement element and the simple natural frequency of the second displacement expander is different than the simple natural frequency of the second displacement element. ~~expanders.~~

11. (Once Amended) An actuator comprising:

a displacement element for generating a specific displacement;

a displacement expander for transmitting the displacement of said displacement element and expanding the displacement, said displacement expander having elasticity in the direction of said displacement;

a transmitter for transmitting the displacement expanded by said displacement expander to a driven member;

a presser for pressing said transmitter against the driven member; and

a driver for driving said displacement ~~element~~ element,

wherein the driver includes an oscillator for providing a drive signal that oscillates the displacement element at a first phase angle and oscillates the displacement expander at a second phase angle substantially supplementary to said first phase angle, thereby causing

~~such that~~ said specific displacement of said displacement element ~~is~~ to be restrained by contractions or expansions of said displacement expander.

13. (Once Amended) An actuator as claimed in claim 12, wherein said displacement element is driven by ~~a~~ the drive signal, wherein the drive signal has ~~signal of~~ a frequency near the simple natural frequency of said displacement expander, and wherein said simple natural frequency of the displacement expander is different than the simple natural frequency of the displacement element. ~~expander.~~

14. (Once Amended) An actuator as claimed in claim 11, wherein said displacement element is driven by ~~a~~ the drive signal, wherein the drive signal has ~~signal of~~ a frequency near the simple natural frequency of said displacement expander, and wherein said simple natural frequency of the displacement expander is different than the simple natural frequency of the displacement element. ~~expander.~~

Claims 16-24 have been added.